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IMPLEMENTATION PLAN NAVY ENVIRONMENTAL LEADERSHIP PROGRAM TECHNOLOGY DEMONSTRATION FOR BIOREMEDIATION OF CONCRETE SURFACES AND SOIL AT SOLID WASTE MANAGEMENT UNIT 14 NS MAYPORT FL

11/1/1995

ABB ENVIRONMENTAL SERVICES

IMPLEMENTATION PLAN
NAVY ENVIRONMENTAL LEADERSHIP PROGRAM
TECHNOLOGY DEMONSTRATION FOR BIOREMEDIATION OF CONCRETE SURFACES AND SOIL AT SOLID WASTE MANAGEMENT UNIT 14

U.S. NAVAL STATION
MAYPORT, FLORIDA

Unit Identification Code No. N60201

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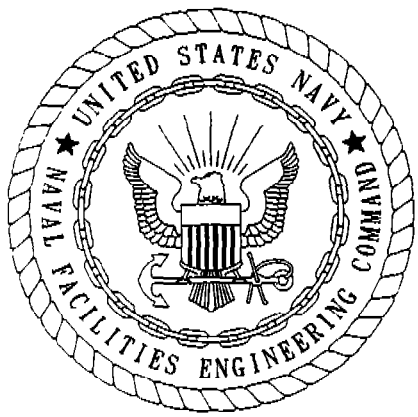

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/028 are complete and accurate and comply with all requirements of this contract.

DATE: November 20, 1995

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(DFAR 252.227-7036)

FOREWORD

In order to meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense (DOD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. These acts are the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Navy Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adapted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages.

- The preliminary assessment (PA) identifies potential sites through record searches and interviews.
- A site inspection (SI) then confirms which areas contain contamination, constituting actual "sites." (Together, the PA and SI steps were called the initial assessment study (IAS) under the Navy's old NACIP program.)

- Next, the remedial investigation and the feasibility study (RI/FS) together determine the type and extent of contamination, establish criteria for cleanup, and identify and evaluate any necessary remedial action alternatives and their costs. As part of the RI/FS, a risk assessment identifies potential effects on human health or the environment in order to help evaluate remedial action alternatives.

- The selected alternative is planned and conducted in the remedial design and remedial action stages. Monitoring then ensures the effectiveness of the effort.

A second program to address present hazardous material management is the Resource Conservation and Recovery Act (RCRA) Corrective Action program. This program is designed to identify and clean up releases of hazardous substances at RCRA-permitted facilities. RCRA is the law that ensures that solid and hazardous wastes are managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

This program is conducted in three stages.

- The RCRA facility assessment identifies solid waste management units (SWMUs), evaluates the potential for releases of contaminants, and determines the need for future investigations.

- The RCRA facility investigation then determines the nature, extent, and fate of contaminant releases.

- The corrective measures study (CMS) identifies and recommends measures to correct the release.

The hazardous waste investigations at Naval Station Mayport are presently being conducted under the RCRA Corrective Action program. Earlier preliminary investigations had been conducted at Naval Station Mayport under the Navy's old NACIP program and IR program following Superfund guidelines. In 1988, in coordination with the U.S. Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP), the hazardous waste investigations were formalized under the RCRA program.

Naval Station Mayport is conducting the cleanup at their facility by working through the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFAC-ENGCOM). The USEPA and the FDEP oversee the Navy environmental program. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the RCRA program at Naval Station Mayport should be addressed to Mr. David Driggers, Code 1852, at (803) 743-0501.

EXECUTIVE SUMMARY

As part of the Navy Environmental Leadership Program, a technology demonstration for bioremediation of petroleum contaminated soil and concrete surfaces is being performed at Solid Waste Management Unit 14, the Mercury/Oil Waste Spill Area. The technology demonstration will be conducted by RHS Technical Services, Inc. ABB Environmental Services, Inc. will observe the technology demonstration, collect baseline and performance evaluation samples, and prepare a technology evaluation report.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, xylene
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
µg/ℓ	microgram per liter
mg/ℓ	milligrams per liter
NAVSTA	Naval Station
NEESA	Navy Environment and Energy Support Division
NELP	Navy Environmental Leadership Program
NPDES	National Pollutant Discharge Elimination System
OWTP	oily waste treatment plant
PAH	polynuclear aromatic hydrocarbon
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RAP	remedial action plan
RCRA	Resource Conservation and Recovery Act
RHS	RHS Technical Services, Inc.
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SWMU	Solid Waste Management Unit
TRPH	Total Recoverable Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
VOH	volatile organic halocarbon

1.0 INTRODUCTION

A technology demonstration is being conducted under the Navy Environmental Leadership Program (NELP) for concrete containing petroleum residues and soil containing petroleum-related constituents at Solid Waste Management Unit (SWMU) 14 at Naval Station (NAVSTA) Mayport, Florida (Figures 1-1 and 1-2). NELP was created to promote the use of new and innovative technologies in the areas of compliance, conservation, cleanup, and pollution prevention within the Navy. NAVSTA Mayport was selected to participate in NELP because activities at this station are representative of similar activities at other naval stations.

ABB Environmental Services, Inc (ABB-ES), has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFAC-ENGCOM) to provide technical oversight during the technology demonstration that is planned for SWMU 14. This implementation plan was prepared to outline and describe activities and responsibilities necessary for technical oversight of the technology demonstration.

1.1 PURPOSE OF IMPLEMENTATION PLAN. This implementation plan includes the following activities:

- an overview of SWMU 14, including a summary of site history, definitions of concrete containing petroleum residue and soil containing petroleum-related constituents, and identification of treatment levels;
- identification of the roles and responsibilities of the participants involved in the technology demonstration;
- a description of technical oversight activities to be performed by ABB-ES;
- an overview of the technology evaluation report to be prepared by ABB-ES upon completion of the technology demonstration, and
- a schedule of activities for the technology demonstration.

1.2 REGULATORY HISTORY OF SWMU 14. SWMU 14 includes is a large concrete pad, adjacent to Buildings No. 1456 and 1388, that is used for firefighting training activities. The firefighting training activities conducted at SWMU 14 included the placing of used oil and other materials directly on the training pad within a bermed area and igniting the used oil (A.T. Kearney, 1989). Not all of the oil used in the training exercises was consumed in the fires. Much of the oil not consumed in the fire was washed from the pad by the water used to extinguish the fires. Since 1987, the oily-water runoff has been collected in an oil-water separator or a concrete detention basin prior to being pumped to the oily waste treatment plant (OWTP) (A.T. Kearney, 1989).

The concrete detention pond was constructed in 1978 east of the firefighting training area. Stormwater drains from the firefighting training areas through a series of catch basins to an oil-water separator prior to treatment in the OWTP. The detention pond receives firefighting waste liquid when the oil-water separator

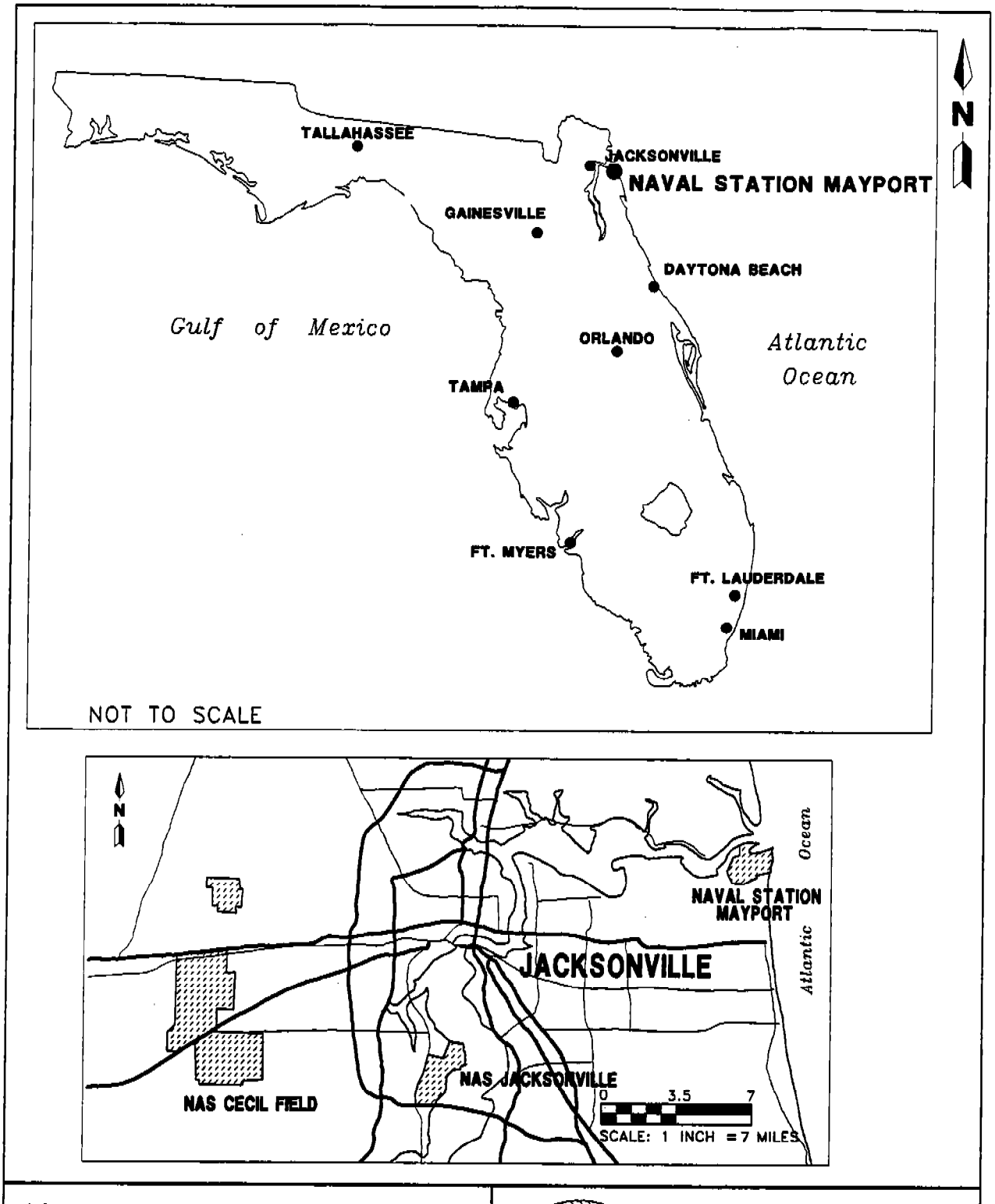

FIGURE 1-1
FACILITY LOCATION MAP

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IMPLEMENTATION PLAN
NELP TECHNOLOGY DEMONSTRATION

U.S. NAVAL STATION MAYPORT, FLORIDA

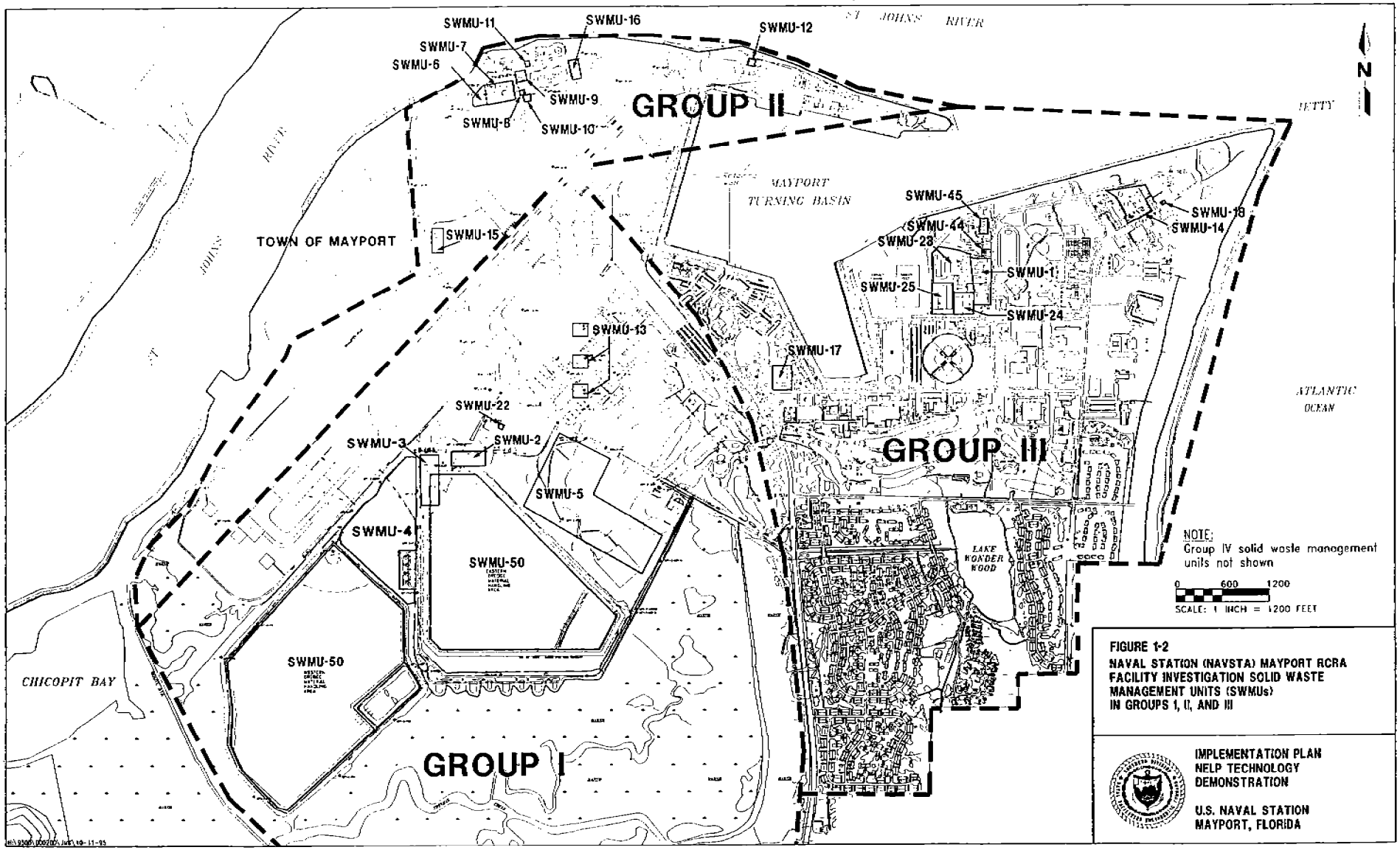

FIGURE 1-2
NAVAL STATION (NAVSTA) MAYPORT RCRA FACILITY INVESTIGATION SOLID WASTE MANAGEMENT UNITS (SWMUs) IN GROUPS I, II, AND III

IMPLEMENTATION PLAN
NELP TECHNOLOGY DEMONSTRATION

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is full. In addition, personnel who have worked at the NAVSTA Mayport firefighting training area in the past suggest that during the mid 1970s to early 1980s the piping from the oil-water separator to the OWTP would occasionally back up (A.T. Kearney, 1989). When this occurred, the manhole located southwest of Building 351 would overflow, allowing oily-water from the firefighting training activities to flow into an open stormwater drainage ditch, eventually emptying into the detention pond. During periods of heavy rainfall, the detention pond often overflowed, resulting in a release of oily-water from firefighting training and stormwater containing petroleum-related constituents onto the soils surrounding the detention pond.

The goal of the technology demonstration project is to demonstrate the applicability of bioremediation to reduce levels of petroleum residues on the concrete of the stormwater detention pond and the levels of petroleum-related constituents in the soils south of the detention pond. Petroleum staining of the concrete apron located in the firefighting training areas will not be addressed as part of the technology demonstration. Figure 1-3 shows the location and general site features of SWMU 14, including areas which will be treated during the technology demonstration.

1.3 TARGET TREATMENT LEVELS FOR CONCRETE AND SOIL CONTAINING PETROLEUM-RELATED CONSTITUENTS AT SWMU 14. The petroleum residue staining the concrete at SWMU 14 is most likely within the top layer of concrete in the detention pond. Because the concrete pad is a solidified mass, the likelihood of ingestion and inhalation of oil-containing dust from the pad is small. The most likely route of exposure for human or ecological receptors is either through dermal contact or ingestion of stormwater runoff from the detention pond.

The station presently is a group participant in the Navy-wide National Pollutant Discharge Elimination System (NPDES) storm water discharge permit. That permit limits the amount of oil and grease in the discharge to 5.0 milligrams per liter (mg/ℓ). Visual parameters are also regulated in the permit. These parameters include debris, foam, and any sheen that can be seen in the discharge. The runoff from the detention pond after treatment must comply with all conditions of the existing NPDES permit. In addition, the runoff must comply with Florida Surface Water Quality Standards, Florida Administrative Code (FAC) 62-302 (Florida Department of Environmental Protection [FDEP], 1995). Table 1-1 gives target treatment levels for chemicals applicable to petroleum-related constituents. These chemicals were chosen based on the site history of SWMU 14. FAC 62-302 gives a full listing of the standards for surface water for all chemicals. The runoff leaving the detention pond after the demonstration would have to meet the full requirements of FAC 62-302 as well as the existing NPDES permit.

Soil south of the detention pond may contain residual levels of petroleum constituents as a result of overflows from the detention pond. Ingestion of soil at the SWMU is unlikely as the area is an industrial site, and access is restricted. Inhalation of petroleum-containing dust and dermal contact with the surface soils are the most likely exposure pathways for humans. Soil containing petroleum-related constituents must meet clean soil requirements after treatment as described in Thermal Treatment Facilities for Petroleum Contaminated Soil, FAC 62-775 (FDEP, 1992) as well as Guidelines for Assessment and Remediation of Petroleum Contaminated Soil (FDEP, 1994). Target treatment levels for surface soils at SWMU 14 are listed in Table 1-2 and are based on the above-referenced documents.

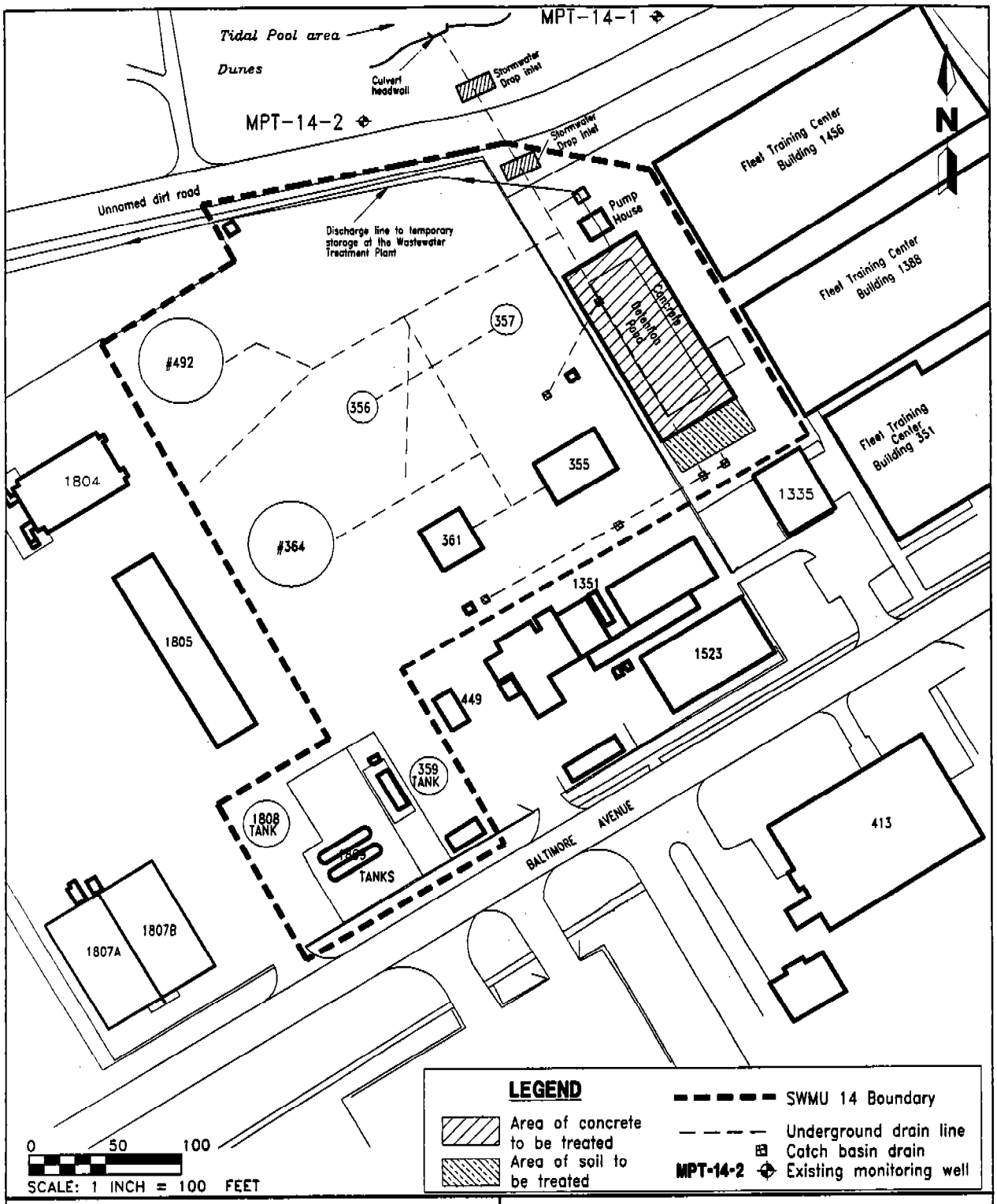

FIGURE 1-3
SOLID WASTE MANAGEMENT UNIT (SWMU) 14
GENERAL LOCATION AND SITE FEATURES

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IMPLEMENTATION PLAN
NELP TECHNOLOGY DEMONSTRATION

U.S. NAVAL STATION
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Table 1-1
Target Treatment Levels for Concrete Treatment Runoff

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Constituent	Target Treatment Level[1]
Acenaphthene	Shall not exceed 2,700 $\mu g/\ell$.
Anthracene	Shall not exceed 110,000 $\mu g/\ell$.
Benzene	Shall not exceed 71.28 $\mu g/\ell$ annual average.
Dissolved oxygen	Shall not average less than 5,000 $\mu g/\ell$ in a 24-hour period and shall never be less than 4,000 $\mu g/\ell$. Normal daily and seasonal fluctuations above these levels shall be maintained.
Fluoranthene	Shall not exceed 370 $\mu g/\ell$.
Fluorene	Shall not exceed 14,000 $\mu g/\ell$.
Lead	Shall not exceed 5.6 $\mu g/\ell$.
Mercury	Shall not exceed 0.012 $\mu g/\ell$.
Oils and greases	Dissolved or emulsified oils and greases shall not exceed 5.0 $\mu g/\ell$. No undissolved oil or visible oil shall be present so as to cause taste or odor or otherwise interfere with the beneficial use of the water.
Polynuclear aromatic hydrocarbons (PAHs)[2]	Shall not exceed 0.031 $\mu g/\ell$ annual average[3].
Pyrene	Shall not exceed 11,000 $\mu g/\ell$.

[1] Target treatment levels taken from the requirements of Florida Administrative Code (FAC) 62-302, (FDEP, 1995) for Class III marine waters.
[2] PAHs indicate the total of acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benxo(b)fluoranthene, benzo(g,h,i)-perylene, benzo(k)fluoranthene, chrysene, dibenzyl(a,h)anthracene, indeno(1,2,3-cd)pyrene, and phenanthrene.
[3] Annual average means the maximum concentration at average annual flow conditions.

Notes: SWMU = solid waste management unit.
$\mu g/\ell$ = micrograms per liter.

Table 1-2
Target Treatment Levels for Soil

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Constituent	Target Treatment Level (ppm)[1]
Total recoverable petroleum hydrocarbons (TRPH)	50
Volatile organic aromatics (BTEX)	0.1
Volatile organic halocarbons (VOH)	0.05
Polynuclear aromatic hydrocarbons (PAHs)	1.0
Arsenic	10
Barium	4,940
Cadmium	37
Chromium	50
Lead	108
Mercury	23
Selenium	389
Silver	353

[1] Target treatment levels are specified in the Florida Administrative Code (FAC) 62-775.
[2] If TRPH is below 10 ppm, PAHs and VOHs do not have to meet the target treatment levels listed in this table, as per FAC 62-775.

Notes: SWMU = solid waste management unit.
ppm = parts per million.
BTEX = benzene, toluene, ethylbenzene, and xylene.

1.4 AREA OF CONCRETE AND VOLUME OF SOIL CONTAINING PETROLEUM-RELATED CONSTITUENTS TO BE REMEDIATED AT SWMU 14. RHS Technical Services, Inc. (RHS), the remedial action contractor, proposes to treat approximately 1,000 square yards of concrete stained with petroleum residue (RHS, 1995a). The area to be treated (approximately 800 square yards) is the concrete area within the detention pond (Figure 1-3). Concrete stained with petroleum residues in the firefighting training area will not be addressed during this demonstration.

RHS proposes to treat approximately 100 cubic yards of soil containing petroleum-related constituents (RHS, 1995b). The area to be treated (approximately 55 feet by 25 feet, assuming a 2-foot depth) is shown on Figure 1-3 and is located south of the stormwater detention pond.

2.0 PROPOSED NELP ACTIVITIES FOR SWMU 14

Through NELP, the Navy proposes to demonstrate that removal of petroleum-related constituents from concrete and surface soil at SWMU 14 can be accomplished by using *insitu* bioremediation. RHS has been selected, by the Navy, as the contractor to demonstrate the ability of their technology to meet this goal.

RHS proposes to treat 1,000 square yards of concrete stained with petroleum residues within the detention pond (RHS, 1995a). A microbial solution will be applied to the concrete containing residual oil in several 10-square-foot areas, unless RHS's site supervisor determines that conditions warrant otherwise. Once applied, the surface of the areas will be periodically agitated, using a mechanical scrubber, to emulsify and separate the oils from the concrete so the microbes can biodegrade the petroleum-related constituents (RHS, 1995a). The area being remediated will be sprayed with a fine mist of water to keep the surface wet throughout treatment and to control temperature. RHS plans to use visual inspection of the treatment area to determine when the remediation process is complete (RHS, 1995a).

Runoff from the area of remediation will flow toward a drain at the northern end of the detention pond. Runoff from the treatment area will be collected by RHS prior to the drain and placed in a temporary tank until the completion of the demonstration. Upon completion of the demonstration, samples will be collected to ensure that any residual oil will not affect downstream treatment units or surface water quality (FAC 62-302).

In order to treat the surface soils south of the detention pond, RHS will spray a microbial solution on the land surface and rototill the soil to ensure proper mixing as well as to introduce oxygen into the underlying soils. Aeration ports may be drilled throughout the land area to further aerate the soils (RHS, 1995b). Soil samples will be collected by RHS during and upon completion of the demonstration to ensure that the technology is operating effectively.

3.0 IMPLEMENTATION OF TECHNOLOGY DEMONSTRATION FOR SWMU 14

This chapter includes an overview of the activities necessary for implementation of the technology, the oversight activities to be conducted by ABB-ES, the sampling and analysis program, and how analytical results will be evaluated upon completion of the technology demonstration.

3.1 OVERVIEW OF ACTIVITIES FOR IMPLEMENTATION. As part of implementing the NELP technology demonstration, the following activities are planned:

- RHS submits a final remedial action plan (RAP) for the technology demonstration.
- ABB-ES submits a final implementation plan for the technology demonstration.
- RHS RAP and ABB-ES implementation plan are approved by SOUTHNAVFACENGCOM, FDEP, and the U.S. Environmental Protection Agency (USEPA).
- Samples of runoff from the detention pond and soil samples south of the detention pond are collected by ABB-ES to provide a baseline to assess the performance of the *in situ* bioremediation relative to the target treatment levels (Tables 1-1 and 1-2).
- Technology demonstration occurs (as described in the RHS RAP).
- Samples of runoff and soil are collected and analyzed to assess whether the technology has achieved target treatment levels.
- A technology evaluation report is prepared by ABB-ES describing the implementation and results of the technology demonstration.

A responsibility assignment matrix outlines the activities necessary for the technology demonstration and identifies the parties who have lead, support, review, or approval responsibility (Table 3-1).

3.2 TECHNICAL OVERSIGHT OF TECHNOLOGY DEMONSTRATION. ABB-ES will provide technical oversight of the technology demonstration contractor, RHS. ABB-ES will be onsite during the technology demonstration to observe the contractor's activities, including:

- site preparation,
- mobilization and demobilization,
- operation and maintenance activities, and
- the administration of any ancillary equipment or services to evaluate the technology (e.g., air monitoring or laboratory analytical services). ABB-ES will also collect runoff and soil samples, as outlined in Section 3.3. Oversight activities and runoff and soil sample analytical results will be summarized in a technology evaluation report (see Section 3.4).

Table 3-1
Responsibility Assignment Matrix

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Task	ABB-ES	RHS	SOUTHNAVFAC-ENGCOM	ACTIVITY	FDEP	USEPA
Provide technology demonstration workplan (RAP)	Review	Lead	Approval	Review	Approval	Approval
Provide implementation plan	Lead	Information	Approval	Review	Approval	Approval
Perform baseline runoff and soil sampling	Lead	Information	Review	Support	--	--
Implement technology demonstration	Support	Lead	Support	Support	--	--
Implement performance evaluation sampling	Lead	Support	Support	Support	--	--
Technology evaluation report	Lead	Information	Approval	Review	Approval	Approval

Notes: SWMU = solid waste management unit.
ABB-ES = ABB Environmental Services, Inc.
RHS = RHS Technical Services, Inc.
SOUTHNAVFACENGCOM = Southern Division, Naval Facilities Engineering Command.
ACTIVITY = Naval Station Mayport.
FDEP = Florida Department of Environmental Protection.
USEPA = U.S. Environmental Protection Agency.
RAP = remedial action plan.
-- = not applicable.

3.3 SAMPLING AND ANALYSIS PROGRAM. The methodology for runoff and soil sample collection will be consistent with standard operating procedures described in the NAVSTA Mayport RCRA Facility Investigation workplan (ABB-ES, 1991), the NAVSTA Mayport General Information report (ABB-ES, 1995), and USEPA Region IV standard operating procedures (USEPA, 1991). The samples will be shipped to a laboratory by express-overnight delivery under the chain-of-custody protocol.

As part of the technology demonstration for SWMU 14, runoff and soil samples will be collected and analyzed by ABB-ES. The analytical results will be evaluated to assess whether the technology demonstration, performed by RHS, has achieved target treatment levels. RHS may collect runoff and soil samples before, during, and after the NELP technology demonstration independent of the sampling to be conducted by ABB-ES.

Baseline and performance evaluation samples of runoff and soil will be collected by ABB-ES prior to and upon completion of the technology demonstration to assess whether *in situ* bioremediation has achieved target treatment levels. In addition, quality assurance/quality control (QA/QC) samples will be collected during baseline and performance verification sampling to ensure the validity of the data obtained during sample analysis. The following provides the rationale for collection and analysis of runoff and soil samples at SWMU 14 during the technology demonstration.

Table 3-2 provides a summary of the runoff samples, and Table 3-3 provides a summary of the soil samples to be collected and analyzed during the sampling and analysis program. Paragraphs 3.3.1 and 3.3.2 provide further detail.

3.3.1 Baseline Sampling of Concrete and Soil Runoff leaving the detention pond and the soil south of the detention pond must be sampled prior to treatment to quantify the concentrations of petroleum-related constituents at the start of the technology demonstration.

Prior to the technology demonstration, the detention pond will be drained of all standing water and the outlets plugged to prevent water used during the demonstration from exiting the pond. The area will be sprayed by ABB-ES prior to treatment, using a high pressure washer, to evaluate the concentrations of petroleum-related constituents in the runoff as a result of the stained concrete at the bottom of the detention pond. Runoff samples will be collected at the drain, located at the northern end of the detention pond or from a temporary sump constructed with Visqueen, before the runoff enters the temporary tank. The volume of water used will be measured so that the same volume can be used to collect the performance evaluation samples. A total of four runoff samples will be collected: one sample at the beginning of the runoff event (MPT-14-SW01), two in the middle, and one sample at the end of the runoff event (MPT-14-SW02). Runoff samples will be analyzed for petroleum-related constituents listed in FAC 62-302, using the appropriate testing method. QA/QC samples will also be collected as specified in Table 3-2. Table 3-4 shows the approved testing methods for petroleum-related constituents, chosen based on the site history of SWMU 14.

Total recoverable petroleum hydrocarbons (TRPH) will be analyzed, although not listed in FAC 62-302, to provide an accurate baseline in order to determine the effectiveness of the demonstrated technology. A full listing of constituents can be found in FAC 62-302.

Table 3-2
Sampling and Analysis Program, Runoff

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Sample Number	Sample Interval[1]	Purpose	Analytical Parameters and Methods[2]
MPT-14-SW01	Beginning	Baseline	Table 3-4
MPT-14SW02	1/3	Baseline	Table 3-4
MPT-14-SW03	2/3	Baseline	Table 3-4
MPT-14-SW04	End	Baseline	Table 3-4
MPT-14-SW02D	NA	QA/QC - Baseline	Table 3-4
MPT-14-SW02MS	NA	QA/QC - Baseline	Table 3-4
MPT-14-SW02MSD	NA	QA/QC - Baseline	Table 3-4
MPT-14-TB	NA	QA/QC - Baseline	Table 3-4[3]
MPT-14-RB	NA	QA/QC - Baseline	Table 3-4
MPT-14-FB	NA	QA/QC - Baseline	Table 3-4
MPT-14-SW05	Beginning	Performance	Table 3-4
MPT-14-SW06	1/3	Performance	Table 3-4
MPT-14-SW07	2/3	Performance	Table 3-4
MPT-14-SW08	End	Performance	Table 3-4
MPT-14-SW05	Tank[4]	Performance	Table 3-4
MPT-14-SW06	Tank[4]	Performance	Table 3-4
MPT-14-SW04D	NA	QA/QC - Performance	Table 3-4
MPT-14-SW04MS	NA	QA/QC - Performance	Table 3-4
MPT-14-SW04MSD	NA	QA/QC - Performance	Table 3-4
MPT-14-TB	NA	QA/QC - Performance	Table 3-4[3]
MPT-14-RB	NA	QA/QC - Performance	Table 3-4
MPT-14-FB	NA	QA/QC - Performance	Table 3-4

[1] Indicates at what time during the runoff event the sample will be collected.
[2] Analytical parameters and methods are specified in the table listed in this column.
[3] Trip blanks will only be analyzed for volatile organic compounds.
[4] These samples will be collected from the tank; therefore, a sample interval does not apply.

Notes: SWMU = solid waste management unit.
MPT = U.S. Naval Station, Mayport, Florida.
SW = surface water.
NA = not applicable.
QA/QC = quality assurance/quality control.
D = sample duplicate.
MS = matrix spike.
MSD = matrix spike duplicate.
TB = trip blank.
RB = rinsate blank.
FB = field blank.

Table 3-3
Sampling and Analysis Program, Soil Sampling

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Sample Number	Sample Depth (ft/bls)	Purpose	Analytical Parameters and Methods[1]
MPT-14-SS18	0 to 1	Baseline	Table 3-5
MPT-14-SB18	1 to 2	Baseline	Table 3-5
MPT-14-SS19	0 to 1	Baseline	Table 3-5
MPT-14-SB19	1 to 2	Baseline	Table 3-5
MPT-14-SS20	0 to 1	Baseline	Table 3-5
MPT-14-SB20	1 to 2	Baseline	Table 3-5
MPT-14-SB20D	1 to 2	QA/QC - Baseline	Table 3-5
MPT-14-SB20MS	1 to 2	QA/QC - Baseline	Table 3-5
MPT-14-SB20MSD	1 to 2	QA/QC - Baseline	Table 3-5
MPT-14-TB	NA	QA/QC - Baseline	Table 3-5[2]
MPT-14-RB	NA	QA/QC - Baseline	Table 3-5
MPT-14-FB	NA	QA/QC - Baseline	Table 3-5
MPT-14-SS18	0 to 1	Performance	Table 3-5
MPT-14-SB18	1 to 2	Performance	Table 3-5
MPT-14-SS19	0 to 1	Performance	Table 3-5
MPT-14-SB19	1 to 2	Performance	Table 3-5
MPT-14-SS20	0 to 1	Performance	Table 3-5
MPT-14-SB20	1 to 2	Performance	Table 3-5
MPT-14-SB20D	1 to 2	QA/QC - Performance	Table 3-5
MPT-14-SB20MS	1 to 2	QA/QC - Performance	Table 3-5
MPT-14-SB20MSD	1 to 2	QA/QC - Performance	Table 3-5
MPT-14-TB	NA	QA/QC - Performance	Table 3-5[2]
MPT-14-RB	NA	QA/QC - Performance	Table 3-5
MPT-14-FB	NA	QA/QC - Performance	Table 3-5

[1] Analytical parameters and methods are specified in the table listed in this column.
[2] Trip blanks will only be analyzed for volatile organic compounds.

Notes: SWMU = solid waste management unit.
ft = feet.
MPT = U.S. Naval Station, Mayport, Florida.
SB = subsurface soil.
QA/QC = quality assurance/quality control.
MSD = matrix spike duplicate.
NA = not applicable.
FB = field blank.
bls = below land surface.
SS = surface soil.
D = duplicate.
MS = matrix spike.
TB = trip blank.
RB = rinsate blank.

Table 3-4
Runoff Analysis

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Constituent	Testing Method
Acenaphthene	USEPA Method SW-846 8100
Anthracene	USEPA Method SW-846 8100
Benzene	USEPA Method SW-846 8020
Dissolved oxygen	USEPA Method 360.1 or 360.2 (field measurement)
Fluoranthene	USEPA Method SW-846 8100
Fluorene	USEPA Method SW-846 8100
Lead	USEPA Method SW-846 7421
Mercury	USEPA Method SW-846 7470
Oils and greases	USEPA Method 413.1
Polynuclear aromatic hydrocarbons (PAHs)	USEPA Method SW-846 8310
Pyrene	USEPA Method SW-846 8100
Total recoverable petroleum hydrocarbons (TRPH)	USEPA Method 418.1

Notes: SWMU - solid waste management unit.
USEPA = U.S. Environmental Protection Agency.

Samples of soil south of the detention pond will be collected for analysis. Guidelines for the Assessment and Remediation of Petroleum Contaminated Soil (FDEP, 1994) specifies that soil containing petroleum-related constituents, to be treated by a method other than thermal treatment, should use a soil sampling frequency for pretreatment equivalent to the requirements of FAC 62-775.410 (FDEP, 1992). Since RHS proposes to treat 100 cubic yards of soil, FAC 62-775.410 stipulates at least three composite soil samples would be required. Each composite must consist of at least four grab sample aliquots. Appendix A provides a more detailed calculation.

A sampling grid was developed to determine the locations of grab samples and composites. Using the model developed by R.O. Gilbert (1987), an appropriate grid size was calculated assuming a 90 percent probability of finding a hot spot 12 feet in radius. Based on the assumptions, an appropriate grid size was determined to be 14 feet. Grab samples will be collected from 0 to 1 feet below land surface (bls) (surface soil) and 1 to 2 feet bls (subsurface soil) from each location. All grab samples collected 0 to 1 foot bls along a line parallel to the edge of the detention pond will be composited, as shown on Figure 3-1. Likewise, all grab samples collected 1 to 2 feet bls along a line parallel to the detention basin will be composited, as shown on Figure 3-1. The grab sampling locations may vary along a 3-foot radius, as visual observation during sampling may show obvious areas of staining or stressed vegetation indicating the possibility of soil containing petroleum-related constituents. Appendix A contains a more detailed calculation.

The surface soil composite samples are designated MPT-14-SS18, MPT-14-SS19, and MPT-14-SS20, as shown on Figure 3-1. The subsurface soil sample composites are designated MPT-14-SB18, MPT-14-SB19, and MPT-14-SB20, as shown on Figure 3-1. QA/QC samples will be collected as specified in Table 3-3.

In order to effectively analyze the soil at SWMU 14 for volatile organic compounds, at one of the grab sampling locations for each composite, two grab samples will be collected: one of the grab samples will be retained for volatile organic compound analysis only, and one will be composited along with the grab samples collected at the other locations. The location of the grab sample for volatile organic compound analysis is not specified; however, visual observation of the site (i.e., any obvious areas of staining) will be used to locate this grab sample.

In summary, the total number of soil samples to be collected is as follows:

- six composite samples will be collected, and
- six grab samples will be collected per composite (five to be composited and one for volatile organic compound analysis).

The composite samples will be analyzed for TRPH and metals (total), using the approved testing methods listed in Table 3-5. The grab samples collected for volatile organic compound analysis will be analyzed for volatile organic aromatics (BTEX) using the approved testing methods listed in Table 3-5.

3.3.2 Performance Evaluation Sampling of Treated Concrete and Soil During the technology demonstration, RHS may collect samples of runoff and soil to evaluate the effectiveness of their *in situ* bioremediation treatment system. ABB-ES will collect samples of runoff and samples of treated soil upon completion of the

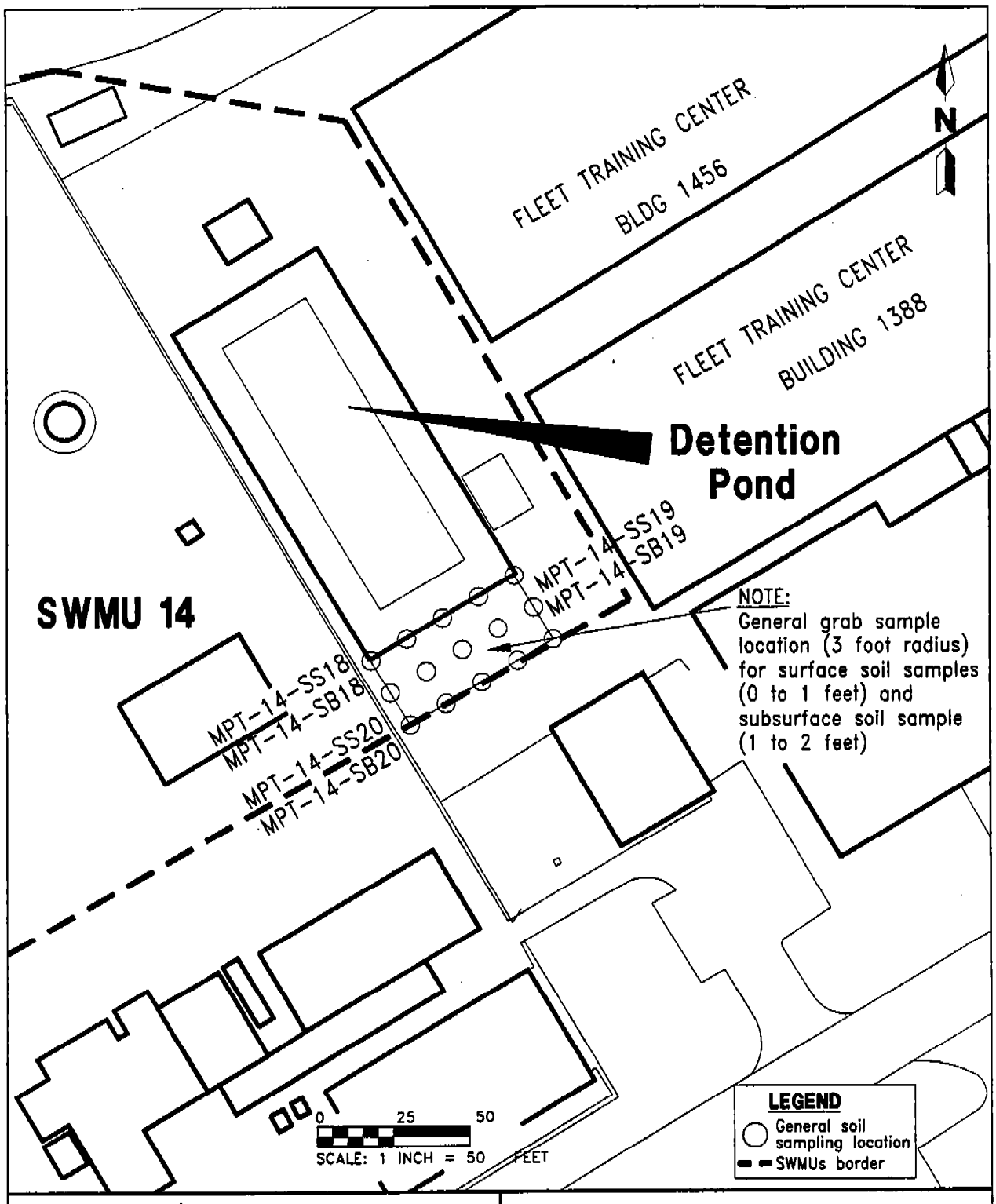


FIGURE 3-1
SOLID WASTE MANAGEMENT UNIT 14
SOIL SAMPLING LOCATION

H:\9500\002800\JMK\10-10-95

IMPLEMENTATION PLAN
NELP TECHNOLOGY
DEMONSTRATION

U.S. NAVAL STATION
MAYPORT, FLORIDA

Table 3-5
Soil Analysis, Baseline and Performance Evaluation Sampling

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Constituent	Testing Method[1]
Volatile organic aromatics (BTEX)	USEPA Method 5030/8010
Volatile organic halocarbons (VOH)	USEPA Method 5030/8020
Polynuclear aromatic hydrocarbons (PAHs)	USEPA Method 8100
Total organic halides	USEPA Method 5050/9056
Total recoverable petroleum hydrocarbons (TRPH)	USEPA Draft Method 3540/9073
Metals[2] (total)	USEPA Methods 6010 and 7471

[1] U.S. Environmental Protection Agency (USEPA) SW-846 as specified by Florida Administrative Code (FAC) 62-775.
[2] Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

Notes: SWMU = solid waste management unit.
BTEX = benzene, toluene, ethylbenzene, xylene.

technology demonstration to assess whether target treatment levels have been achieved.

Upon completion of the technology demonstration, RHS will spray the entire area of treated concrete using a high-pressure washer to create runoff and mobilize any remaining petroleum-related constituents. Runoff samples will be collected prior to the temporary tank. A total of four runoff samples will be collected: one sample at the beginning of the runoff event (MPT-14-SW03), two in the middle, and one sample at the end of the runoff event (MPT-14-SW04).

In order to determine if the water used throughout the technology demonstration can be recycled or released, two water samples will be collected from the temporary tank (MPT-14-SW05 and MPT-14-SW06).

QA/QC samples will be collected as listed in Table 3-2. Runoff samples and samples collected from the tank will be analyzed for constituents listed in FAC 62-302, using the appropriate testing method. Table 3-5 shows the appropriate testing methods for petroleum-related products, chosen based on the past site history of SWMU 14.

Treated soil samples will be collected from the same general locations as described in Paragraph 3.3.1. As a result, six composite samples (MPT-14-SS18, MPT-14-SB18, MPT-14-SS19, MPT-14-SB19, MPT-14-SS20, and MPT-14-SB20) will be collected. Each grab sample for surface soil samples will be collected 0 to 1 foot bls, and each grab sample for subsurface soil samples will be collected 1 to 2 feet bls. The number of samples specified meets the requirements of Guidelines for Assessment and Remediation of Petroleum Contaminated Soil (FDEP, 1994) for treated soil. QA/QC samples will be collected as listed in Table 3-3.

As described in Paragraph 3.3.1, soil samples for volatile organic compound analysis will be collected at one of the grab sampling locations for each composite. Two grab samples will be collected at this location: one of the grab samples will be retained for volatile organic compound analysis only, and one will be composited along with the grab samples collected at the other locations. The location of the grab sample for volatile organic compound analysis will be the same location as that of baseline sampling for each composite in order to effectively compare the results of baseline and performance verification sample analysis.

The composite samples will be analyzed for TRPH, polynuclear aromatic hydrocarbons (PAHs), total organic halides, and metals, as stated in FAC 62-775. The grab samples collected for volatile organic compound analysis will be analyzed for BTEX and volatile organic halocarbons (VOHs). The testing methods to be used are listed in Table 3-5.

3.3.3 QA/QC Sampling QA/QC sampling will be conducted according to Naval Energy and Environment Support Activity (NEESA) Level C requirements. QA/QC samples will be collected during baseline and performance evaluation sampling. Trip, rinsate, and field blanks will be collected and analyzed. All trip blanks will be analyzed for appropriate volatile organic compounds. Rinsate and field blanks will be analyzed for the constituents in Table 3-4 for runoff and tank samples, and for the constituents in Table 3-5 for soil samples (whichever is appropriate). Sample duplicates, matrix spikes, and matrix spike duplicates will also be collected and

analyzed for the constituents in Table 3-4 (runoff and tank samples) and Table 3-5 (soil samples), whichever is appropriate.

In addition to the soil and water samples to be collected by ABB-ES, measurements of rainfall and maximum and minimum air temperatures will be obtained from the NAVSTA Mayport meteorology department. The period that the measurements will be obtained include 1 month prior to the date the technology demonstration begins up to the date the performance evaluation samples are collected.

3.3.4 Analytical Program The analytical data package produced by the laboratory will be NEESA Level C. The rationale for using NEESA Level C is to provide analytical data that could be validated substituting the SW846 method criteria for USEPA's Contract Laboratory program method criteria using National Functional Guidelines for Organic Data Review (USEPA, 1990). The data will be validated so that the appropriate decision can be made as to whether the concrete or soil at the site should be further evaluated through the Resource Conservation and Recovery Act (RCRA) Corrective Action program.

3.3.5 Interpretation of Analytical Results The analysis of the soil samples will be conducted using appropriate USEPA methodology contained in the Test Methods for Evaluating Solid Waste, Physical and Chemical Methods USEPA SW846 (USEPA, 1986). The analysis of runoff samples will be conducted using the reference listed above or, when appropriate, by Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (USEPA, 1983). Analytical results from the performance evaluation runoff and soil sampling programs will be evaluated by direct comparison to target treatment levels as specified in Tables 1-1 and 1-2. If a runoff or tank water sample contains concentrations of substances above target treatment levels (Table 1-1), the runoff or tank water will not be considered to have met the requirements of FAC 62-302. Likewise, if a soil sample contains concentrations of substances above target treatment levels (Table 1-2), the soil will not be considered to have met the requirements of FAC 62-775.

3.4 TECHNOLOGY EVALUATION REPORT. A technology evaluation report will be prepared for the Navy by ABB-ES to export information on the innovative technology within SOUTHNAVFACENGCOM and the Navy. The report will include descriptions of the technology demonstration and oversight activities performed by ABB-ES, photographs of the technology demonstration, a discussion of the results of the sampling and analysis activities, and an evaluation of the effectiveness of the technology at achieving treatment levels.

The effectiveness of the technology demonstration will be evaluated by comparing the analytical results from runoff and soil samples collected during baseline and performance evaluation sampling to target treatment levels (Tables 1-1 and 1-2). The percent reduction in constituents will be calculated and will be based on comparison of the performance evaluation samples with the baseline samples. The report will also discuss uncertainties, if any, of the evaluation of the data and ability of the technology demonstration to meet target treatment levels.

The findings from the technology demonstration will be summarized in a conclusions section.

Correspondence separate from the technology evaluation report will identify whether additional corrective action activities are necessary. An outline of the technology evaluation report is provided in Table 3-6.

Table 3-6
Outline of Technology Evaluation Report

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

1.0 INTRODUCTION

2.0 SUMMARY OF TECHNOLOGY DEMONSTRATION

- 2.1 PROPOSED ACTIVITIES
- 2.2 FIELD DEMONSTRATION
- 2.3 MONITORING ACTIVITIES DURING DEMONSTRATION

3.0 SUMMARY OF OVERSIGHT ACTIVITIES

- 3.1 GENERAL OBSERVATIONS AND NOTES
- 3.2 RESULTS OF BASELINE SAMPLING AND ANALYSIS
- 3.3 RESULTS OF PERFORMANCE EVALUATION AND ANALYSIS

4.0 EVALUATION OF TECHNOLOGY DEMONSTRATION

- 4.1 COMPARISON OF BASELINE PERFORMANCE EVALUATION RESULTS

5.0 UNCERTAINTIES

6.0 CONCLUSIONS

Note: SWMU = solid waste management unit.

4.0 SCHEDULE

The following is a proposed schedule for the technology demonstration. The dates provided in the schedule are tentative; however, the duration of each task is accurate.

Table 4-1
Schedule of NELP Activities, SWMU 14

Implementation Plan, Navy Environmental Leadership Program
Technology Demonstration for Bioremediation at SWMU 14
U.S. Naval Station
Mayport, Florida

Task	Start Date	Complete Date
Provide technology demonstration workplan (RAP)	December 1994	September 1995
Provide implementation plan	August 1995	October 1995
Perform baseline sampling on runoff and soil	October 1995	October 1995
Implement technology demonstration	November 1995	December 1995
Implement performance evaluation sampling	January 1996	January 1996
Technology evaluation report	February 1996	April 1996

Notes: SWMU = solid waste management unit.
RAP = Remedial Action Plan

REFERENCES

ABB Environmental Service, Inc. (ABB-ES), 1991, Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) workplan, U.S. Naval Station, Mayport, Florida, Volumes I, II, and II (interim final): prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), North Charleston, South Carolina.

ABB-ES, 1995, RCRA Corrective Action program General Information report, U.S. Naval Station, Mayport, Florida: prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina, July.

Florida Department of Environmental Protection, 1994, Guidelines for Assessment and Remediation of Petroleum Contaminated Soil, Division of Waste Management, Bureau of Waste Cleanup, Engineering Support Section, May.

Gilbert, R.O., 1987, *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold: New York.

Kearney, A.T., 1989, RCRA Facility Assessment of the Naval Station Mayport, Jacksonville, Florida, (Final Report): prepared for the U.S. Department of the Navy, SOUTHNAVFACENGCOM, Charleston, South Carolina, April.

RHS Technical Services, Inc. (RHS), 1995a, General Procedure for Bioremediation of Hydrocarbon Contaminated Concrete Surfaces, Naval Station, Mayport, Florida, SWMU 14, September.

RHS, 1995b, General Procedure for *In Situ* Hydrocarbon Soil Bioremediation, Naval Station, Mayport, Florida Area SWMU 14, September.

U. S. Environmental Protection Agency (USEPA), 1983, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March.

USEPA, 1986, Test Methods for Evaluating Solid Waste, Physical and Chemical Methods, SW846.

USEPA, 1990, National Functional Guidelines for Organic Data Review, December (revised June 1991).

USEPA, 1991, Environmental Compliance Branch Standard Operation Procedures and Quality Assurance Manual, USEPA Region IV, Environmental Services Branch, Athens, Georgia, February.

APPENDIX A

SAMPLING CALCULATIONS

PROJECT	COMP. BY	JOB NO.
NELP Implementation Plan [illegible]	TH	08534.33
[illegible] calculations	CHK. BY	DATE
		7.95

Determine the number of samples and location of samples necessary for Backfill soil sampling.

Given:
- length of detention basin adjacent to area of soil contamination = 55 feet
- 100 yd^3 of soil [illegible] be treated

Assumptions:
- area of soil to be treated is 55 feet (width of detention basin) by 25 feet
- Assume a hot spot radius of L = 12 feet

Using the R.O. Gilbert model to determine grid spacing:

Assume:
- p = 0.1 (assumes a 90% probability of finding a hotspot)
- a square shaped grid
- S = 0.5 (a conservative elliptical shape)

Using p and S look on Figure 10.3 and find $\frac{L}{G}$ = 0.85

$\frac{L}{G} = 0.85$ where L = 12 feet

$G = \frac{12 \text{ feet}}{0.85} = 14.12 \text{ feet} \sim 14 \text{ feet}$

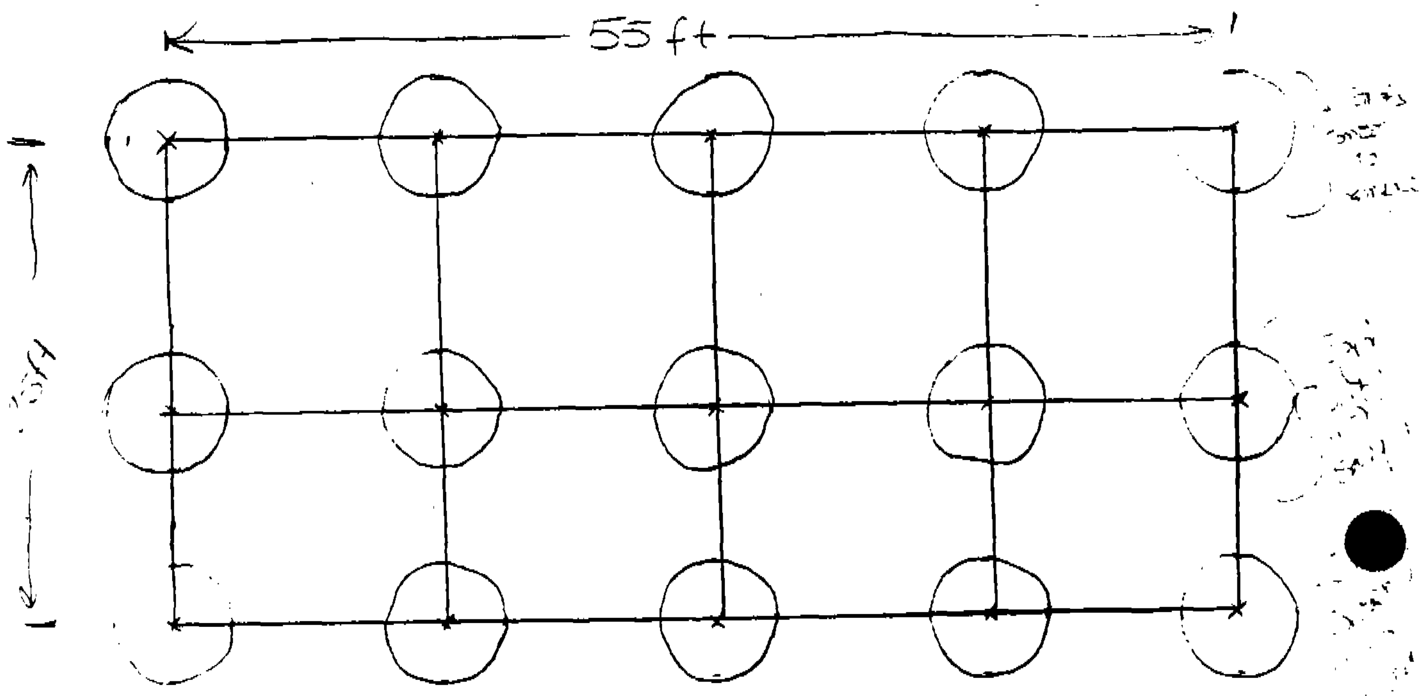
Now plot the grid based on the grid spacing (see next page)

PROJECT	COMP. BY	JOB NO.
[illegible] Implementation Plan [illegible] Sampling Calculations	TJH	[illegible]
	CHK. BY	DATE
	[illegible]	[illegible]

Plotting Sampling Grid

1 arg box = 100 ft^2

|⟵⟶| = 10 feet



Grid spacing every 14 feet

As shown 15 grab samples would be collected
All grabs along the same horizontal line would be
composited into one sample (for a total of 3 [illegible])

* A ◯ indicates the general area where the grab sample would
be collected based on prevailing site conditions. All ◯'s
have a radius = 3 ft.

FORM 00.01 REV. 4/81

ABB Environmental Services, Inc.

APPENDIX B

RESPONSE TO REGULATORY COMMENTS

ABB

November 10, 1995

Commanding Officer
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
Charleston SC 29418

Attention: Mr. David Driggers (Code 1582)

SUBJECT: **FDEP Technical Review Comments Implementation Plan, Navy Environmental Leadership Program (NELP) Technology Demonstration for Bioremediation of Concrete Surfaces and Soil at SWMU 14**
U.S. Naval Station, Mayport, FL
Contract No. N62467-87-D-0317 CTO#028

Dear Mr. Driggers:

The following presents response to comments made in correspondence dated October 19, 1995 by the Florida Department of Environmental Protection (FDEP) concerning the Navy Environmental Leadership Program (NELP) Technology Demonstration for Bioremediation of Concrete Surfaces and Soil at SWMU 14, U.S. Naval Station, Mayport, Florida dated September 1995.

Comment 1. Section 1.4 Page 1-9 and page 2-1: the statement that 1,000 square yards will be treated appears to be erroneous; approximately 798 yards appears to be the correct amount.

Response. The 1,000 square yards is the unit area of concrete surface that RHS Technical Services, Inc., (RHS) has contracted with Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) to clean. Based on the plan view of the detention pond illustrated in Figure 3-1, the area to be cleaned by RHS is approximately 800 square yards. The Technology Implementation Plan will be amended to include this information.

Comment 2. Section 3.3.2, page 3-10: indicates that sampling will occur during the beginning, middle and end of the runoff event. I suggest quantifying the event (by volume or time) prior to beginning the actual runoff water application (I know this is obvious). Additionally, some thought should be given to the time since antecedent rainfall during both the initial characterization sampling and the confirmation sampling since it seems like this may affect the sampling results.

Response. A statement will be added to pages 3-4 and 3-12 to indicate that measurements will be made of the volume of water used and duration of baseline (page 3-4) and performance sampling events (page 3-12). Measurements of rainfall and maximum and minimum air temperatures will be obtained from the NAVSTA Mayport meteorology department. The period that the measurements will be obtained

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include 1 month prior to the date the technology demonstration begins up to the date the performance evaluation samples are collected.

Comment 3. Section 3.3.2, page 3-12: this section discusses baseline and performance sampling; will the practice of "roto-tilling: during the demonstration effect the direct comparison of samples.

Response. The "roto-tilling" could have an effect on the direct comparison of the baseline and performance samples. A possible effect may be the reduction in concentration from blending of soils containing higher and lower concentrations of hydrocarbons. Uncertainty associated with the comparison of the baseline and performance samples will be discussed in the uncertainty section of the Technology Evaluation Report.

It should be noted that ABB-ES is responsible only for locating, collecting and analyzing samples described in the Implementation Plan, NELP Technology Demonstration for Bioremediation of Concrete Surfaces and Soil at SWMU 14. ABB-ES is not responsible for locating, collecting or analyzing samples described in the workplans by RHS dated September 11, 1995, entitled General Procedure for Bioremediation of Hydrocarbon Contaminated Concrete Surfaces and General Procedure for *Insitu* Hydrocarbon Soil bioremediation or any subsequent modification to this plan.

If you have any questions regarding the response to FDEP's comments, please call me at 904-656-1293.

Very truly yours,

ABB ENVIRONMENTAL SERVICES INC.

Francis K. Lesesne, P.G.
Principal Geologist

Terry J. Hansen, P.G.
Task Order Manager

CC: Ms. Cheryl Mitchel, NAVSTA Mayport.